

Subject: Corrigendum to SFQP of Transmission line of RE/DMS Works Doc No: C/ FQA/ FQP/ DMS/TL (Rev. 06) Dtd. 10.07.2024.

S. No.	Description of Activity	Terms to be checked	Test/Checks to be done	Reference Documents	Check/ Testing		Counter Check/ Test Check by POWERGRID	Accepting Authority in POWERGRID
					Agency	Extent		

SFQP Cl. 4.A.1; Pg 3 of 14[Existing Clause]

4.		A.1	Physical tests	As per document at Annexure-I of this FQP	Contractor Samples to be taken jointly with POWERGRID and tested at POWERGRID approved lab	<p>(i) No physical testing is required in case of cement procured directly from the main producer/manufacturer and if cement (in good condition without setting) is used within three (3) months from the manufacturing date based on MTC. MTC shall be reviewed</p> <p>(ii) Testing (Physical & Chemical) shall be done in case storage of cement is more than three (3) months.</p> <p>Note: In case small works having contract value not more than Rs 15 Lakhs, no testing is required in case cement procured directly from the main producer/manufacturer or authorised /notified distributor/dealer of the Main producer and if cement (in good condition without setting) is used within three (3) months from the</p>	100% review of lab test results. Test results shall be sent by the Lab. by E-mail directly to POWERGRID. Further, a hard copy of test certificate shall also be sent by the Lab directly to POWERGRID by postal Address.	Site In-charge
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						manufacturing date based on MTC. MTC shall be reviewed.		
SFQP Cl. 4.A.1; Pg 3 of 14 [Revised Clause]								
4.		A.1	Physical tests	As per document at Annexure-I of this FQP	Contractor Samples to be taken jointly with POWERGRID and tested at POWERGRID approved lab	<p>(I) No testing is required in case of cement Procured directly from the main producer/manufacturer/<u>authorized dealer with traceability</u> and if cement (in good condition without setting) is used within three (3) months from the manufacturing date based on MTC.MTC Shall be reviewed.</p> <p>(II) Testing (Physical & Chemical) shall be done in case storage of cement is more than three (3) months.</p> <p>Note: In case small works having contract value not more than Rs 15 Lakhs, no testing is required in case cement procured directly from the main producer/manufacturer or authorised /notified distributor/dealer of the Main producer and if cement (in good condition without setting) is used within three (3) months from the manufacturing date based on MTC. MTC shall be reviewed.</p>	100% review of lab test results. Test results shall be sent by the Lab. by E-mail directly to POWERGRID. Further, a hard copy of test certificate shall also be sent by the Lab directly to POWERGRID by postal Address.	Site In-charge

Ankit
21/11/2025



अंकित मीना / ANKIT MEENA
Engineer (Field Quality Assurance)

पावर ग्रिड कॉर्पोरेशन ऑफ इंडिया लिमिटेड
Power Grid Corporation of India Ltd
(एनएसई एक्स/एनएसई एक्स लिस्टेड) / (A Govt. of India Enterprise)
Plot No.-2, Sector-29, Gurgaon- 122 001 (Haryana)

STANDARD FIELD QUALITY PLAN

Item	Transmission Line of RE/DMS Works	SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
Applicability	POWERGRID DMS Projects	REV.	06
Date of Issue	10.07.2024		
Validity	Till next revision		

Page 1 of 14

S. No.	Description of Activity	Terms to be checked	Test/Checks to be done	Reference Documents	Check/Testing		Counter Check/Test by POWERGRID	Accepting Authority n POWERGRID
					Agency	Extent		
1	Route Survey and Pole Spotting	Route Alignment	Optimization of route length	a. Identified routes b. POWERGRID approved procedure	Contractor	100% at field	100% review of records /documents, witness 10% at field	line In charge
		Pole Spotting	Ground Clearance	POWERGRID Technical Specification	Contractor	100% at field	100% review of records /documents and witness 10% at field	line In charge
		SP/ DP/TP/ FP Structure spotting	Span and Angle of deviation	Pole spotting data/ POWERGRID approved procedure/ Technical Specifications	Contractor	100% at field	100% review of records /documents and witness 25% cut point locations	Line In charge
		DT location	Near load Centre to the extent possible	POWERGRID approved procedure/ Technical Specifications	Contractor	100% at field	100% at field	Site In charge
2	Excavation	Excavation of pH for erection of pole	Dimensional check	Approved drawing /POWERGRID Technical Specification	Contractor	100% at field	Witness 25% at field	Site In charge



STANDARD FIELD QUALITY PLAN

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Applicability	POWERGRID DMS Projects
Date of Issue	10.07.2024
Validity	Till next revision

SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
REV.	06

Page 2 of 14

S. No.	Description of Activity	Terms to be checked	Test/Checks to be done	Reference Documents	Check/Testing		Counter Check/Test by POWERGRID	Accepting Authority n POWERGRID
					Agency	Extent		
3	Pole Erection	A) Material receipt - PSC Poles/ Rail poles. Tubular Pole, Joist Pole, Cross arms, Bolts & Nuts, washers,	Visual, dimensional, stacking, Galvanizing defects, painting of poles etc.	Approved drawing/ BOM/ POWERGRID Specifications/ POWERGRID approved painting procedure	Contractor	100% at store & field	100% at store	Site In charge
		B) Erection of Poles, Cross Arms	Tightening of bolts & nuts. Alignment /Placement and verticality	Approved drawing/ BOM/POWERGRID Specifications.	Contractor	100% at field	Witness 25% at field	Site In charge
4	Pole Foundation/ Stay set Foundation	A) Material for Foundation						
		1)Cement	Source approval	Cement of approved brands according to the COV in POWERGRID web site may be procured and validity of BIS license to be ensured.	Contractor	As proposed by Contractor	Any new brand cement proposed by Contractor shall be assessed by RHQ-FQA and approved by Regional Head with BIS License, validity. After approval, details shall be forwarded to CC FQA for uploading in COV.	Site In charge



STANDARD FIELD QUALITY PLAN

Item	Transmission Line of RE/DMS Works
Applicability	POWERGRID DMS Projects
Date of Issue	10.07.2024
Validity	Till next revision

SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
REV.	06

S. No.	Description of Activity	Terms to be checked	Test/Checks to be done	Reference Documents	Check/Testing		Counter Check/Test by POWERGRID	Accepting Authority n POWERGRID
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			Physical tests	As per document at Annexure-1 of this FQP	Contractor Samples to be taken jointly with POWERGRID and tested at POWERGRID approved lab	<p>(i) No physical testing is required in case of cement procured directly from the main producer/manufacture and if cement (in good condition without setting) is used within three (3) months from the manufacturing date based on MTC. MTC shall be reviewed</p> <p>(ii) Testing (Physical & Chemical) shall be done in case storage of cement is more than three (3) months.</p> <p>Note: In case small works having contract value not more than Rs 15 Lakhs, no testing is required in case cement procured directly from the main producer/manufacture or authorised /notified distributor/dealer of the Main producer and if cement (in good condition without setting) is used within three (3) months from the manufacturing date based on MTC. MTC shall be reviewed.</p>	100% review of lab test results. Test results shall be sent by the Lab. by E-mail directly to POWERGRID. Further, a hard copy of test certificate shall also be sent by the Lab directly to POWERGRID by postal Address.	Site In charge
			Chemical Tests: Chemical composition of Cement	-do-	Contractor to submit MTC	Review of all MTC's	100% review of MTC test results	Site In charge



STANDARD FIELD QUALITY PLAN

Item	Transmission Line of RE/DMS Works
Applicability	POWERGRID DMS Projects
Date of Issue	10.07.2024
Validity	Till next revision

SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
REV.	06

Page 4 of 14

S. No.	Description of Activity	Terms to be checked	Test/Checks to be done	Reference Documents	Check/Testing		Counter Check/Test by POWERGRID	Accepting Authority n POWERGRID
					Agency	Extent		
		2) Fine aggregate and coarse aggregate	Source approval	POWERGRID specification	Contractor	Contractor to indicate location of Quarry	To verify source approval	Site In charge
			Physical test	As per relevant IS 383:2016, IS 2386: reaffirmed 2021 /POWERGRID specification	Contractor	One sample per source to be taken jointly from POWERGRID site & to be tested in POWERGRID accepted test lab/site/store lab		Site In charge
		3) Water	Water shall be fresh & clean/potable	POWERGRID specification	Contractor	100% visual check at site	Random check at site	Site In charge
		B) Concreting work						
		Before concreting excavation	Dimensions and Alignment	Approved drawing /POWERGRID Specification	Contractor	100% visual check at site	Witness 25% at field	Site In charge
		C) During Concreting 1) Workability	Slump test	As per relevant IS 1199-2018, Reaffirmed 2023 /Approved drawing/POWERGRID Specification	Contractor	01 no per day	Random	Site In charge



STANDARD FIELD QUALITY PLAN

Item	Transmission Line of RE/DMS Works
Applicability	POWERGRID DMS Projects
Date of Issue	10.07.2024
Validity	Till next revision

SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
REV.	06

S. No.	Description of Activity	Items to be checked	Test/Checks to be done	Reference Documents	Check/Testing		Counter Check/Test by POWERGRID	Accepting Authority n POWERGRID
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		2) Concrete Strength	Cubes compressive strength	As per POWERGRID Specifications & as per Annexure-2 of this SFQP	<p>Contractor Casting of cubes at site. Cubes to be tested for 28 days strength at POWERGRID In-house Lab/At site (if testing machine installed by contractor is duly calibrated by NABL Lab.) POWERGRID approved Lab Cubes at 100% location are to be taken in presence of POWERGRID officials</p> <p>Concrete composition and batch record for each and every lot shall be maintained as per IS 4926:2003, reaffirmed 2022. The raw material in the RMC bins must be from approved sources/ brands make.</p>	<p>One cube set sample consisting of three cubes per village or one sample per 100 poles or part thereof However, in case of concrete supplied by RMC, one set of 3 nos. of cubes for every 50 cum or part thereof for each day of concreting and 28 days compressive strength shall be tested.</p> <p>Concrete Cube collection & testing in case of RMC:</p> <p>Ready Mix Concrete (RMC) may be allowed and testing/acceptance documentation to be maintained shall be as per as per IS: 4926:2003, reaffirmed 2022. Concrete cube sampling should be done at site. However, in case cube samples cannot be taken at site, taking of cube samples at RMC is acceptable.</p>	<p>Normally testing shall be carried out at the POWERGRID in-house cube testing facility. Alternatively, samples shall be tested at cube testing facility installed by contractor at POWERGRID premises, in the witness of POWERGRID. Lastly, POWERGRID approved Labs, in this case, test results shall be sent by the Lab, by E-mail directly to POWERGRID; further, a hard copy of the Test Certificate shall also be sent by the Lab directly to POWERGRID by Postal Address.</p> <p>NOTE: The efforts shall be made to carry out 100% cube testing in the in-house cube testing facility.</p>	<p>Site In charge All cubes shall be tested at In-house testing facilities. However, in case of breakdown of CTM or other force majeure conditions, cubes may be tested at approved TPL. Out of testing on 10% samples to be witnessed at TPL by POWERGRID Site Engineer and at least 5% samples at random, shall be witnessed by Site In-charge. In-case of Site/ POWERGRID Lab, 100% witness by POWERGRID Representative.</p>



STANDARD FIELD QUALITY PLAN

Item	Transmission Line of RE/DMS Works
Applicability	POWERGRID DMS Projects
Date of Issue	10.07.2024
Validity	Till next revision

SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
REV.	06

S. No.	Description of Activity	Terms to be checked	Test/Checks to be done	Reference Documents	Check/Testing		Counter Check/Test by POWERGRID	Accepting Authority n POWERGRID
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	C) Membrane Curing			IS 456:2000, Reaffirmed 2021	Contractor	In addition to the moist curing of cast concrete structures, membrane curing is also introduced as per IS 456:2000, Reaffirmed 2021/ Manufacturer's catalogue.	100%	
		3) Fixing of Stay Rod, Anchor Plate	Position Alignment/ Angle	Approved drawing/POWERGRID specification	Contractor	100% at site	Witness 25% at field	Site In charge
5	SP/DP/TP/FP Structure Erection	Material receipt DP Structure. Cross arms, Bolts & Nuts, washers,	Visual, dimensional stacking, Galvanizing defects etc.	Approved drawing/ BOM /POWERGRID Spec.	Contractor	100% at store & field	100% at store	Site In charge
		Erection - DP Structure, Cross arms. Bolts & Nuts, washers clamp etc.	Tightening of bolts & nuts, Alignment /Placement and vertically	Approved drawing/ BOM /POWERGRID Specification.	Contractor	100% at field	Witness 25% at field	Site In charge
6	Installation of GOAB Switches/ Isolators/ D O Fuse sets/ LA*	Material - Air break switches/insulators, DO F uses, LA. Bolts & Nuts, Washers, Clamps etc.	Visual, dimensional, Stacking, Galvanizing defects, damages, Identification etc.	Approved drawing/ BOM / POWERGRID specification	Contractor	100% at store & field	100% at store	Site In charge
		Installation - Air break Switches, insulators. D O. Fuses, IA	Tightening of bolts & nuts. Alignment /Placement and vertically	Approved drawing/ BOM /POWERGRID specification.	Contractor	100% at field	Witness 25% at field	Site In charge

* Corrected content



STANDARD FIELD QUALITY PLAN

Item	Transmission Line of RE/DMS Works
Applicability	POWERGRID DMS Projects
Date of Issue	10.07.2024
Validity	Till next revision

SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
REV.	06

Page 7 of 14

S. No.	Description of Activity	Terms to be checked	Test/Checks to be done	Reference Documents	Check/Testing		Counter Check/Test by POWERGRID	Accepting Authority n POWERGRID
					Agency	Extent		
7	Erection of stay set	Material Anchor rod, Turn buckle. Guy strain, Insulator, bolts & nuts, washers, clamps. Guy wire, Guy grip etc.	Visual, dimensional, stacking. Galvanizing defects, damages Identification etc.	Approved drawing/ IOM/POWERGRID specification.	Contractor	100% at store & field	100% at store	Site In charge
		fixing of Guy	Fixing, tightening of bolts & nuts, guy grip, tensioning of Guy	Approved drawing/ BOM/ POWERGRID specification	Contractor	100% at field	Witness 25% at field	Site In charge
8	Stringing	1) Material						
		a) Insulators	Visual check for cleanness/glazing/damage & white spots etc.	Approved drawing/ BOM /POWERGRID specification	Contractor	100% at site	100% at store and 25% at site	Site In charge
		B) insulator hardware & Conductor accessories	Visual check for Galvanizing defects, damages etc.	Approved drawing/ BOM /POWERGRID specification	Contractor	100% at site	100% at store	Site In charge
		c) Conductor	Visual check for drums, Heat shrinkable Sleeve & lead sealing at both ends,	Approved drawing/ BOM /POWERGRID specification	Contractor	100% at site	100% at store and 25% at site	Site In charge



STANDARD FIELD QUALITY PLAN

Item	Transmission Line of RE/DMS Works
Applicability	POWERGRID DMS Projects
Date of Issue	10.07.2024
Validity	Till next revision

SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
REV.	06

Page 8 of 14

S. No.	Description of Activity	Items to be checked	Test/Checks to be done	Reference Documents	Check/Testing		Counter Check/Test by POWERGRID	Accepting Authority n POWERGRID
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		d) Earth wire/ Guard wire	Visual check for drums. Heat shrinkable sleeve& lead sealing at both ends for earth wire	Approved drawing/ BOM /POWERGRID specification	Contractor	100% at site	100% at store	Site In charge
		e) Aerial Bunched Cable	Visual check for drums. Heat shrinkable sleeve& lead sealing at both ends for earth wire	Approved drawing/ BOM /POWERGRID specification	Contractor	100% at site	100% at store	Site In charge
		2) Site Activity						
		a) Before stringing	Readiness of stringing	Stringing procedure as per POWERGRID Specification	Contractor	100% Visual inspection of Pole Location^^	25% site check	Line In charge
		b) During stringing	Conductor- Visual check for scratch/cuts, repair sleeve, mid span joints etc.	Approved drawing/POWERGRID Specification	Contractor	100% at site	25% site check	Site In charge
		c) Guarding	Road, Highway crossing, Habitation areas	Approved drawing/POWERGRID Specification	Contractor	100% at site	25% site check	Site In charge



STANDARD FIELD QUALITY PLAN

Item	Transmission Line of RE/DMS Works
Applicability	POWERGRID DMS Projects
Date of Issue	10.07.2024
Validity	Till next revision

SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
REV.	06

Page 9 of 14

S. No.	Description of Activity	Items to be checked	Test/Checks to be done	Reference Documents	Check/Testing		Counter Check/Test by POWERGRID	Accepting Authority n POWERGRID
					Agency	Extent		
		d) After stringing	Check for Sag/Tension, electrical clearance, ground clearance five metal clearance, jumpering.	Approved drawing/POWERGRID Specification	Contractor	100% at site	100% record review & 25% site check	Site In charge
		e) Earthing	Jointing, bolt tightness	Approved drawing/POWERGRID Specification.	Contractor	100% at site	25% site check	Site In charge
8	DT and LTD8	Accessories, bushings	Pre commissioning test as per Technical Specification/ Manufacturer s manual	Approved drawing/POWERGRID Specification/ Manufacturer's manual	Contractor	100% at site	100% site check	Site In charge
9	Final testing- a) Pre-commissioning of line b) Commissioning of line	Readiness of lines for Pre commissioning and Commissioning	Completeness of line. Megger test of line & continuity test during per commissioning	POWERGRID Specs. and Clearance of pre-commissioning report from concerned authority	Contractor	100% at site	100% joint checking	Line/Project in charge



STANDARD FIELD QUALITY PLAN

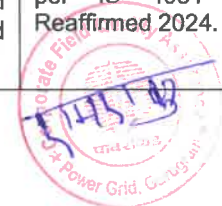
Item	Transmission Line of RE/DMS Works
Applicability	POWERGRID DMS Projects
Date of Issue	10.07.2024
Validity	Till next revision

SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
REV.	06

Annexure-1(Sheet 01 of 03)

ACCEPTANCE CRITERIA AND PERMISSIBLE LIMITS FOR CEMENT

ORDINARY PORTLAND CEMENT					
S. No.	Name of the test	Ordinary Portland Cement 33 grade as per IS 269: 2015	Ordinary Portland Cement 43 grade as per IS 269: 2015	Ordinary Portland Cement 53 grade as per IS 269: 2015	Remarks
a)	Physical tests				To be conducted in POWERGRID approved Lab
(i)	Fineness	Specific surface area shall not be less than 225 sq.m. per Kg. or 2250 cm ² per gm.	Specific surface area shall not be less than 225 sq.m. per Kg or 2250 cm ² per gm.	Specific surface area shall not be less than 225 sq.m. per Kg or 2250 cm ² per gm.	Blaine's air permeability method as per IS 4031 (Part-2):1999, Reaffirmed 2023
(ii)	Compressive strength	72 ± 1 hour: Not less than 16 Mpa (16 N/mm ²) 168 ± 2 hour: Not less than 22 Mpa (22 N/mm ²) 672 ± 4 hour: Not less than 33 Mpa (33 N/mm ²), Not more than 48Mpa (48N/mm ²)	72 ± 1 hour: Not less than 23 Mpa (23 N/mm ²) 168 ± 2 hour: Not less than 33Mpa (33 N/mm ²) 672 ± 4 hour: Not less than 43 Mpa (43 N/mm ²), Not more than 58Mpa (58N/mm ²)	72 ± 1 hour: Not less than 27Mpa (27 N/mm ²) 168 ± 1 hour: Not less than 37Mpa (37 N/mm ²) 672 ± 1 hour: Not less than 53 Mpa (53 N/mm ²)	As per IS 4031 (Part-6): 1988, Reaffirmed 2024
(iii)	Initial & Final setting time	Initial setting time: Not less than 30 minutes Final setting time: Not more than 600 minutes	Initial setting time: Not less than 30 minutes Final setting time: Not more than 600 minutes	Initial setting time: Not less than 30 minutes Final setting time: Not more than 600 minutes	As per IS 4031 (Part-5): 1988 Reaffirmed 2024. -do-
iv)	Soundness	Unaerated cement shall not have an expansion of more than 10mm when tested by Le Chatlier and 0.8% by Autoclave test.	Unaerated cement shall not have an expansion of more than 10mm when tested by Le Chatlier and 0.8% by Autoclave test	Unaerated cement shall not have an expansion of more than 10mm when tested by Le Chatlier and 0.8% by Autoclave test.	Le Chatlier and Autoclave test as per IS 4031 (Part-3): 1988, Reaffirmed 2024.



STANDARD FIELD QUALITY PLAN

Item	Transmission Line of RE/DMS Works
Applicability	POWERGRID DMS Projects
Date of Issue	10.07.2024
Validity	Till next revision

SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
REV.	06

Page 11 of 14

Annexure-1(Sheet 02 of 03)

S. No.	Name of the test	Ordinary Portland Cement 33 grade as per IS 269:2015	Ordinary Portland Cement 43 grade as per IS 269:2015	Ordinary Portland Cement 53 grade as per IS 269:2015	Remarks
b)	Chemical composition tests				Review of MTC only
		a) Ratio of percentage of lime to percentage of silica, alumina & iron oxide 0.66 to 1.02%	a) Ratio of percentage of lime to percentage of silica, alumina & iron oxide 0.66 to 1.02%	a) Ratio of percentage of lime to percentage of silica, alumina & iron oxide 0.80 to 1.02%	
		b) Ratio of percentage of alumina to that of iron oxide Minimum 0.66%	a) Ratio of percentage of alumina to that of iron oxide Minimum 0.66%	a) Ratio of percentage of alumina to that of iron oxide Minimum 0.66%	
		c) Insoluble residue, percentage by mass Max. 5.00%	c) Insoluble residue, percentage by mass Max. 5.00%	c) Insoluble residue, percentage by mass Max. 5.00%	
		d) Magnesia percentage by mass Max. 6%	d) Magnesia percentage by mass Max. 6%	d) Magnesia percentage by mass Max. 6%	
		e) Total Sulphur content calculated as sulphuric anhydride (SO ₃), percentage by mass not more than 3.5%.	e) Total Sulphur content calculated as sulphuric anhydride (SO ₃), percentage by mass not more than 3.5%.	e) Total sulphur content calculated as sulphuric anhydride (SO ₃), percentage by mass not more than 3.5%.	
		f) Total loss on ignition shall not be more than 5 percent	f) Total loss on ignition shall not be more than 5 percent	f) Total loss on ignition shall not be more than 4 percent	
		g) Chloride content, percent by mass, max 0.1%	g) Chloride content, percent by mass, max 0.1%	g) Chloride content, percent by mass, max 0.1%	



STANDARD FIELD QUALITY PLAN

Item	Transmission Line of RE/DMS Works
Applicability	POWERGRID DMS Projects
Date of Issue	10.07.2024
Validity	Till next revision

SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
REV.	06

Page 12 of 14

Annexure-1(Sheet 03 of 03)

S. No.	Name of the test			Remarks
2.	PORTLAND POZZOLANA CEMENT AS PER IS 1489 (Part 1):2005			
a)	Physical tests	i) Fineness	Specific surface area shall not be less than 300 sq.m. per Kg. or 3000 Cm ² per gm.	To be conducted in POWERGRID approved Lab
		ii) Compressive strength	a) 72 ± 1 hour: Not less than 16 Mpa (16 N/mm ²) b) 168 ± 2 hour: Not less than 22 Mpa (22 N/mm ²) c) 672 ± 4 hour: Not less than 33 Mpa (33 N/mm ²)	
		iii) Initial & Final setting time	Initial setting time: Not less than 30 minutes Final setting time: Not more than 600 minutes	
		iv) Soundness	Un aerated cement shall not have an expansion of more than 10mm Le chatlier test and 0.8% by Autoclave test as per IS 4031:1988, reaffirmed 2019 (Part-3)	
b)	Chemical composition tests			
		a) Magnesia percentage by mass Max. 6%		Review of MTC only
		b) Insoluble residue, percent by mass, (a) Maximum $\{x + 4(100-x)/100\}$ (b) Minimum 0.6x, where x is the declared % of fly ash in the given Portland pozzolana cement.		-do-
		c) Total sulphur content calculated as sulphuric anhydride (SO ₃), percentage by mass not more than 3.5		-do-
		d) Total loss on ignition shall not be more than 5 percent		
		e) Chloride content, percent by mass, max 0.1%		



STANDARD FIELD QUALITY PLAN

Item	Transmission Line of RE/DMS Works
Applicability	POWERGRID DMS Projects
Date of Issue	10.07.2024
Validity	Till next revision

SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
REV.	06

Page 13 of 14

Annexure - 2

ACCEPTANCE CRITERIA AND PERMISSIBLE LIMITS FOR CONCRETE WORK

1)	Concrete	a) Workability	Slump shall be recorded by slump cone method, and it shall be between 25-75 mm depending upon workability requirement as per IS 456, Reaffirmed 2021.
		b) Compressive strength	For Concrete Mix (Nominal Mix on Volume basis) For 1:2:4 (Cement: Fine Aggregate: Coarse Aggregate) nominal mix concrete 28 days strength shall be min 210Kg/cm ² .

GENERAL NOTES

1. This standard field quality plan is not to limit the supervisory checks, which are otherwise required to be carried out during execution of work as per drawing/technical specifications etc.
2. Contractor shall be responsible for implementing/documenting the FQP Document shall be handed over by the contractor to PGCIL.
3. Project in charge means over all in charge of work. Line in charge means in charge of the line. Site In charge means in charge of the section.
4. Tests as mentioned in the FQP shall be followed. However, the Project in charge reserves the right to order additional test wherever required.
5. All counter checks/tests shall be carried out by POWERGRID officials at least at the level of Jr Engineer.
6. All materials should have CAT -A CIP before they are erected.
7. In case of any contradiction between technical specification/approved drawings & MQP, the details mentioned in TS/approved drawing shall be final.
8. SP-Single Pole, DP- Double Pole, TP-Triple Pole, FP- Four Pole
9. The cubes shall be taken for the grade of concrete 1:2:4 (Cement: Fine Aggregate: Coarse Aggregate) nominal mix concrete and above.
10. i) For NDT/Core tests results, if not meeting the acceptance criteria, Regional Head is the Accepting Authority.
ii) CGM (Projects) will be the accepting authority for NDT (UPV & RHT) and core testing done on failed concrete cube test results or not meeting the acceptance criteria in a third party approved lab as per Standard procedure for Testing / Assessment of compressive strength concrete in casted foundations and test results are found satisfactory or meet the acceptance criteria laid down in IS codes. A quarterly report in this regard will be submitted to Regional ED.
11. Standard operating procedures (SOP Rev 01) for concrete is annexed at Annexure 3.
12. Acceptance criteria and permissible limits for tests are indicated in the Annexures. However, for further details/tests POWERGRID specification and latest relevant Indian standards shall be referred.



STANDARD FIELD QUALITY PLAN

Item	Transmission Line of RE/DMS Works
Applicability	POWERGRID DMS Projects
Date of Issue	10.07.2024
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SFQP No.	DOC No.: C/FQA/FQP/DMS/TL
REV.	06

Annexure-3

**Standard procedure for Testing/Assessment of compressive strength of cast
Concrete
(Revision-I) issued vide
IOM No: CC: FQA: SOP:2024 dated 05-07-2024**





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दिनांक: 05-07-2024

विषय: Revised (Revision 1) Standard procedure for Testing / Assessment of compressive strength of cast Concrete for nominal and design mix.

Please find enclosed herewith the Revised (Revision 1-SOP) Standard procedure for Testing / Assessment of compressive strength of cast Concrete, duly approved by competent authority. These guidelines are being issued both for nominal mix and design mix concrete. Henceforth, this standard operating procedure (Revision 1-SOP Annexure I) shall be applicable for all future projects of POWERGRID.

This issues with the approval of the Competent Authority.

Encl: Revision 1-SOP Annexure I (08 pages)

एम अशोक कुमार
05/07/2024
(एम अशोक कुमार)

वितरण/Distribution:

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- ES/PS of CMD/Director (Projects)/Director (Operation)/Director (Fin)/CVO
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Standard procedure for Testing/Assessment of compressive strength of cast Concrete

Structural Elements

(A) Foundation shall be divided into two structural elements:

- a) Foundation Pad(s)
- b) Chimney/Column

(B) Pile foundation shall be divided into three structural elements:

- a) Piles
- b) Pile cap (s)
- c) Pedestal
- d) Tie Beam

(C) Building shall be divided into four structural elements:

- a) Foundation pad(s)
- b) Column
- c) Beam
- d) Slab

(D) Miscellaneous infrastructure works - cable trench, Fire wall, Boundary wall Panels, RCC roads , RCC drains

1.0 Acceptance Criteria:

For all RCC structures (such as Foundation Pad, Pile Cap & Pedestal, Roads/Drains/ Column / Chimney/ Cable Trenches/ Firewall/ Boundary wall panels, Beams, Columns & Slabs of Buildings.

1.1 Nominal Mix:

(i) Acceptance of Concrete Cubes test results

If test results of Concrete cubes & Cores are in between 70%-100% of specified grade of concrete, CPWD specifications Cl.no.5.4.10.4, Vol 1 shall be followed. Accordingly, the following may be adopted to consider the acceptance criteria of nominal mix concrete.

- (a) The average of the strength of three (3) specimen be accepted as the compressive strength of the concrete provided the strength of any individual cube shall neither be less than 70% nor higher than 130% of the specified strength.
- (b) If the strength of any individual cube exceeds more than 30% of specified strength, it will be restricted to 130% only for computation of strength.
- (c) If the actual average strength of accepted sample is equal to or higher than specified strength up to 30% then strength of the concrete shall be considered in order and the concrete shall be accepted at full rates.
- (d) If the actual average strength of accepted sample is less than specified strength but not less than 70% of the specified strength, the concrete may be accepted at reduced rate. No NDT such as UPV & RHT etc. shall be carried out.
- (e) In case cube strength is less than 70% of specified strength, then structure shall be rejected (to be dismantled and recast) and thus no payment shall be made.

If, however the Engineer-in-Charge so desires, on critical/ urgent work, additional tests such as UPV, RHT, Core etc. shall be done at the cost of contractor in consultation with FQA to ascertain the quality of cast concrete. On the basis of proposal of site, FQA shall put up their recommendations to Regional-Head regarding acceptance /non-acceptance of concrete based on test results. Regional head shall take further decision on non-accepted works whether the said concrete structure to be retained (with / without strengthening measures) or rejected (to be dismantled and recast).

If strengthening measures are chosen, a strengthening proposal with detailed reasons / justification for not rejecting the concrete shall be submitted to CC -Engg. CC-Engg. will review the strengthening proposal and communicate their approval or revised drawing accordingly.

If structures are retained after strengthening/ rectification measures, All the charges in connection with these additional tests and /or strengthening / rectification work shall be borne by the contractor.

In case such structure is retained, part payment shall be paid as indicated in the payment procedure.

(ii) Acceptance of Core test results:

In case of nominal mix, Acceptance of Concrete Core test results (In case of doubt/strength



is less than 70% of specified strength/concrete cube test results not available).

Core test shall be carried out in case of doubt regarding desired compressive strength of concrete used either due to poor workmanship or based on results of cube strength tests/cube test results are not available.

The acceptability criteria adopted for concrete cube test results of Nominal Mix may also be applicable for Core test results.

1.2 Design mix: Concrete Cubes

Acceptable Compressive strength:- Acceptance of Concrete Cube test results considering average value of three specimens.

a) when mean of the group of four (4) non overlapping consecutive test results:
 $\geq f_{ck} + 0.825 \times$ established standard deviation (rounded off to nearest 0.5 N/mm²)
or
 $f_{ck} + 3$ N/mm²

whichever is greater for M 15 and above and Individual test results minimum $\geq f_{ck}-3$ N/mm²

Notes:

- i) In the absence of established value of standard deviation, the values given in Table -8 in IS 456-2000 may be assumed, and attempt should be made to obtain results of 30 samples as early as possible to establish the value of standard deviation.
- ii) For concrete quantity up to 30 m³ (where number of samples to be taken is less than four (4) as per the frequency of sampling given in 15.2.2 of IS 456:2000), the mean test results of all such samples shall be $f_{ck}+4$ N/mm², minimum and the requirement of minimum individuals test results shall be $f_{ck}-2$ N/mm², minimum. However, when number of sample is only one as per 15.2.2 IS 456:2000, the requirement shall be $f_{ck}+4$ N/mm², minimum.

In case cube strength is as per above, then full payment shall be released.

- b) when compressive strength value is in between f_{ck} and $f_{ck}+4/f_{ck}+3$ as applicable, then the payment shall be made as indicated in the payment procedure. No NDT such as UPV & RHT etc. shall be carried out.
- c) However, in invalid results cases, if there are no further samples available, the average of two (2) closest values may be considered for determination of compressive strength as per IS 516 (Part I/Sec I) 2021. The payment shall be made as indicated in the payment procedure.
- d) In cases, compressive strength is less than f_{ck} and acceptance criteria brought out above, the structure shall be rejected.

If, however the Engineer-in-Charge so desires, on critical/ urgent work, additional tests such as UPV, RHT, Core etc. shall be done at the cost of contractor in consultation with FQA to ascertain the quality of cast concrete. On the basis of proposal of site, FQA shall put up their recommendations to Regional-Head regarding acceptance/non-acceptance of concrete



based on test results. Regional head shall take further decision on non-accepted works whether the said concrete structure to be retained (with / without strengthening measures) or rejected (to be dismantled and recast).

If strengthening measures are chosen, a strengthening proposal with detailed reasons / justification for not rejecting the concrete shall be submitted to CC -Engg. CC- Engg. will review the strengthening proposal and communicate their approval or revised drawing accordingly.

If structures are retained after strengthening/ rectification measures, All the charges in connection with these additional tests and /or strengthening / rectification work shall be borne by the contractor.

In case such structure is retained, part payment shall be paid as indicated in payment procedure.

1.3 Design Mix Concrete Core Test: - Acceptance of concrete core test results:(In case of doubt/If strength is less than Fck/ Concrete cube test results are not available)

Core test shall be carried out in case of doubt regarding strength of concrete used either due to poor workmanship or based on results of cube strength tests or less than fck (Characteristic cube compressive strength of concrete)/Concrete cube test results are not available.

If Average value of core specimens is 85% of the specified Grade of concrete and no individual value is less than 75% of the specified Grade of concrete and the same is considered acceptable as per *B-2.5.1 IS 516(Part4):2018*.

Any compressive strength deviation from the above, the acceptance/rejection procedure has been elaborated in Payment procedure.

1.4 No NDT (RH & UPV testing) test is required if concrete cube strength found in between 70% to 100 % for nominal mix and in between FCK and FCK+3/FCK+4 (as applicable) for design mix. However, If applicable, the NDT (UPV & RH testing) test is to be carried out and accepted as per latest IS 516 (Part-5, Sec-1)/516 (Part-5, Sec-4).

2.0 Payment Procedure:

For all RCC structures (such as Foundation Pad, Pile Cap & Pedestal, Roads/Drains/ Column / Chimney/ Cable Trenches/ Firewall/ Boundary wall panels, Beams, Columns & Slabs of Buildings)

2.1 Payment Procedure (Other than Pile): In case of Nominal Mix

For Concrete Cubes and Cores (Core shall be extracted in case of doubt/If specified strength is less than 70%, in average and individual/ Concrete cube test results are not available)

Acceptable Compressive strength- As per specified strength of concrete.

- a) when Concrete cube or core strength equal or more than specified strength of Concrete, Full payment shall be applicable



- b) when Concrete cube or core strength lies in between 70-100% of the specified strength of Concrete then payment shall be released on prorata basis for concrete portion and full payment shall be made on other components such as excavation, PCC, Reinforcement steel, Shuttering as applicable.
- c) when Concrete cube or core strength is less than 70% of specified strength of Concrete, the Engineer-in-Charge shall reject the defective portion of work represented by sample and no payment shall be made for the rejected work inclusive of concrete, reinforcement steel, PCC, excavation etc.
- d) If, however the Engineer-in-Charge so desires, on critical/ urgent work, additional tests such as UPV, RHT, Core etc. shall be done at the cost of contractor in consultation with FQA to ascertain the quality of cast concrete. On the basis of proposal of site, FQA shall put up their recommendations to Regional-Head regarding acceptance /non-acceptance of concrete based on test results. Regional head shall take further decision on nonaccepted works whether the said concrete structure to be retained (with / without strengthening measures) or rejected (to be dismantled and recast).

If strengthening measures are chosen, a strengthening proposal with detailed reasons / justification for not rejecting the concrete shall be submitted to CC-Engg. CC-Engg. will review the strengthening proposal. and communicate their approval or revised drawing accordingly.

If structures are retained after strengthening/ rectification measures, All the charges in connection with these additional tests and /or strengthening / rectification work shall be borne by the contractor.

In case such structure is retained, no payment shall be made for concreting & full payment of other components such as excavation, PCC, Reinforcement steel, shuttering if applicable as per original approved drawing/BOQ shall be made.

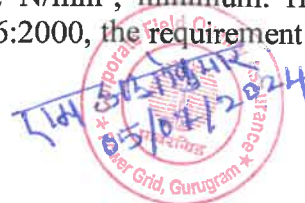
2.2 Payment procedure (Other than Pile) in case of Design Mix: Concrete Cubes

- a) when mean of the group of four (4) non overlapping consecutive test results:
 $\geq fck + 0.825 \times \text{established standard deviation (rounded off to nearest } 0.5 \text{ N/mm}^2)$
or
 $fck + 3 \text{ N/mm}^2$

whichever is greater for M 15 and above and Individual test results minimum $\geq fck-3 \text{ N/mm}^2$

Notes:

- i) In the absence of established value of standard deviation, the values given in Table -8 in IS 456-2000 may be assumed, and attempt should be made to obtain results of 30 samples as early as possible to establish the value of standard deviation.
- ii) For concrete quantity up to 30 m³ (where number of samples to be taken is less than four (4) as per the frequency of sampling given in 15.2.2 (Table 11) of IS 456:2000), the mean test results of all such samples shall be $fck+4 \text{ N/mm}^2$, minimum and the requirement of minimum individuals test results shall be $fck-2 \text{ N/mm}^2$, minimum. However, when number of sample is only one as per 15.2.2 IS 456:2000, the requirement shall be $fck+4 \text{ N/mm}^2$, minimum.



In case cube strength is as per above, then full payment shall be released.

- b) when compressive strength value is in between f_{ck} and $f_{ck}+4/f_{ck}+3$ as applicable, then the payment shall be released on prorata basis for concrete and full payment shall be made towards excavation, PCC, Reinforcement steel, Shuttering as applicable as per drawing/BOQ. No NDT such as UPV & RHT etc shall be carried out.
- c) However, in invalid results cases, if there are no further samples available, the average of two (2) closest values may be considered for determination of compressive strength as per IS 516 (Part I/Sec I) 2021. In such cases when the compressive strength meets the specified strength of Concrete, payment for concrete portion shall be released on prorata basis and full payment on other components such as towards excavation, PCC, Reinforcement steel, Shuttering etc shall be made.
- d) In cases, compressive strength is less than f_{ck} and acceptance criteria brought out above, the structure shall be rejected.

If, however the Engineer-in-Charge so desires, on critical/ urgent work, additional tests such as UPV, RHT, Core etc. shall be done at the cost of contractor in consultation with FQA to ascertain the quality of cast concrete. On the basis of proposal of site, FQA shall put up their recommendations to Regional-Head regarding acceptance /non-acceptance of concrete based on test results. Regional head shall take further decision on non-accepted works whether the said concrete structure to be retained (with / without strengthening measures) or rejected (to be dismantled and recast).

If strengthening measures are chosen, a strengthening proposal with detailed reasons / justification for not rejecting the concrete shall be submitted to CC -Engg. CC, Engg. will review the strengthening proposal and communicate their approval or revised drawing accordingly.

If structures are retained after strengthening/ rectification measures, All the charges in connection with these additional tests and /or strengthening / rectification work shall be borne by the contractor.

In case such structure is retained, no payment shall be made for concreting & full payment of other components such as excavation, PCC, Reinforcement steel, shuttering if applicable as per original approved drawing/BOQ shall be made.

2.3 Payment procedure (Other than Pile) in case of Design Mix: Concrete Cores

Concrete Cores (Core shall be extracted In case of doubt/If specified strength is less than f_{ck} , Concrete cube test results are not available)

The payment procedure for core test results is detailed below:

- i) When equivalent cube strength is equal/more than $f_{ck}+4/f_{ck}+3$ as applicable, then full payment shall be made.
- ii) When equivalent cube strength is in between f_{ck} and $f_{ck}+4/f_{ck}+3$ as applicable/When equivalent cube strength is in between 85% f_{ck} and no individual value is less than 75% of the specified Grade of concrete, the same is considered acceptable, prorata payment for concrete portion and full payment shall be made on other components such as excavation, PCC, Reinforcement steel, Shuttering as applicable.



- iii) In case equivalent cube strength is less than 85%fck and/or an individual core has a strength less than 75%, then structure shall be rejected and thus no payment shall be made.

If, however the Engineer-in-Charge so desires, on critical/ urgent work, additional tests such as UPV, RHT, Core etc. shall be done at the cost of contractor in consultation with FQA to ascertain the quality of cast concrete. On the basis of proposal of site, FQA shall put up their recommendations to Regional-Head regarding acceptance /non-acceptance of concrete based on test results. Regional head shall take further decision on nonaccepted works whether the said concrete structure to be retained (with / without strengthening measures) or rejected (to be dismantled and recast).

If strengthening measures are chosen, a strengthening proposal with detailed reasons / justification for not rejecting the concrete shall be submitted to CC -Engg. CC, Engg. will review the strengthening proposal. and communicate their approval or revised drawing accordingly.

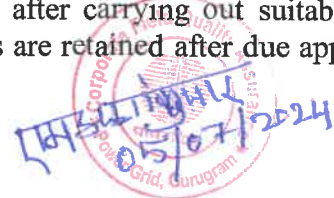
If structures are retained after strengthening/ rectification measures, All the charges in connection with these additional tests and /or strengthening / rectification work shall be borne by the contractor.

In case such structure is retained, no payment shall be made for concreting & full payment of other components such as excavation, PCC, Reinforcement steel, shuttering if applicable as per original approved drawing/BOQ shall be made.

3.0 Acceptance Criteria & Payment procedure for Pile Foundations (Design Mix)

- (i) In case of Pile foundation, when value of Average cube strength is $fck+0.825 \times \text{Standard Deviation}$ or $fck+4/fck+3$ as applicable whichever higher, then Full payment shall be applicable.
- (ii) when value of Average cube strength is equal to or more than fck but less than $fck+0.825 \times \text{Standard Deviation}$ or $fck+4/fck+3$ as applicable which ever greater, then payment shall be released on prorata basis for concrete portion and full payment shall be made to all other components such as boring, SPT, Reinforcement steel, MS Liner, as applicable as per drawing/BOQ.
- (iii) However, in invalid result cases, if there is no further samples available, the average of two (2) closest values may be considered for determination of compressive strength as per IS 516 (Part 1/Sec 1) 2021. In such cases when the compressive strength meets the specified strength of Concrete, payment for concrete portion shall be released on prorata basis and full payment on other components such as towards boring, Reinforcement steel, MS Liner, SPT etc as applicable shall be made.
- (iv) In case compressive strength of cubes observed is less than fck , Vertical load test (routine test) shall be carried out in Pile foundations of Switchyard / Transmission lines wherever applicable in consultation with Engineering to ascertain the capacity of pile as per IS 2911(Part IV). If the test result is meeting the codal requirement, then 50 % payment shall be made for concrete & full payment shall be made towards Boring, Reinforcement steel, SPT, MS Liner as applicable in line with original approved drawings/BOQ.

Alternatively, for Transmission Line cases, if Head of the Region so desires, the proposal may be examined by Engineering for acceptance after carrying out suitable remedial measures including strengthening/ OR if structures are retained after due approval from



Engineering without any rectification. In such cases, 50% payment shall be made for concrete & full payment shall be made towards Boring, Reinforcement steel, SPT, Liner as applicable in line with approved drawings/BOQ.

- (v) If compressive strength of cube of piles observed is less than fck & not technically meeting /cleared by Engineering as brought out above, the structure shall be rejected and then no payment shall be paid for the rejected pile inclusive of concrete, boring, reinforcement steel, MS Liner etc.

4.0 General Notes: -

- i) In case only one set of cube results are available for a location and results are found to be less than 70% of specified strength in case of Nominal Mix, all four legs of the location shall be analyzed as per the procedure as indicated in acceptance criteria.
- ii) However, in case of locations where two or more set of cube results are available and results are found less than 70% of specified strength, in case of Nominal mix, then only one pit shall be excavated at a time (utmost care shall be taken to avoid any damage to concrete surface or disturb undercut zones of foundation) and analyzed those legs as per the procedure as indicated in acceptance criteria.
- iii) The calibration certificate of the rebound hammer should be checked before commencement of a test.
- iv) NDT (UPV & Rebound Hammer Test) or Core Test shall be conducted by POWERGRID approved laboratory. The lab shall be entrusted to carry out the testing which shall be witnessed by Site/FQA executive. The laboratory shall submit the report containing the UPV & Rebound Hammer Test or CoreTest results along with the field data.
- v) Acceptance criteria of construction materials shall be as per SFQP/relevant IS codes.
- vi) For core testing at least three specimens are required as per IS:516(Part-4). While extracting cores, four to five specimens may be taken from the foundation pads (uniformly distributed) such that three sound specimen may be used for testing. Otherwise repeat test shall be made. If cores of sufficient length cannot be extracted for testing due to poor quality of concreting/workmanship etc. as per IS: 516(Part-4), the foundation shall be treated as rejected.
- vii) When core test is carried out, technical acceptance and commercial implications shall be governed solely on the basis of core test results. This shall be applicable for both nominal and design mix concrete.
- viii) For additional structures/piles if any installed in lieu of rejected structure/pile, no payment shall be made for the rejected pile and the additional pile shall be dealt as per the provisions of Contract.
- ix) Generally, Core test should not be repeated after completion and availability of test reports for the same structure of the same batch of concrete.
- x) No core extraction/test is permitted in case of pile foundations
- xi) The provision of additional 5% Core testing as mentioned in SFQP's stands deleted.

